Exploring social justice in UK Flood Risk Management

Present and future

SAYERS AND PARTNERS

JRF JOSEPH ROWNTREE FOUNDATION

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JRF Climate Change and Communities Programme (Katharine Knox)

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Introduction

- **Focus of this presentation**:
  - **Social justice** within UK flood risk management and the challenges presented by climate change through to the 2080s.

Egalitarianism	Rawls Difference Principle	Utilitarianism
(All citizens treated equally through distributive and procedural processes)	**('Maximin Rule')** (Options chosen to assist the most vulnerable)	(Options chosen to maximise return on resources used)

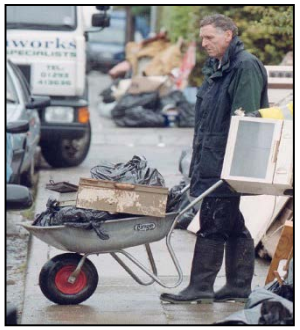
Sayers et al

Introduction

- **Two perspectives of flood disadvantage are considered:**
  - **Geographic flood disadvantage** (communities that are socially vulnerable and exposed to flooding)
  - **Systemic flood disadvantage** (the degree to which vulnerable communities are disproportionately at risk when compared to the average)

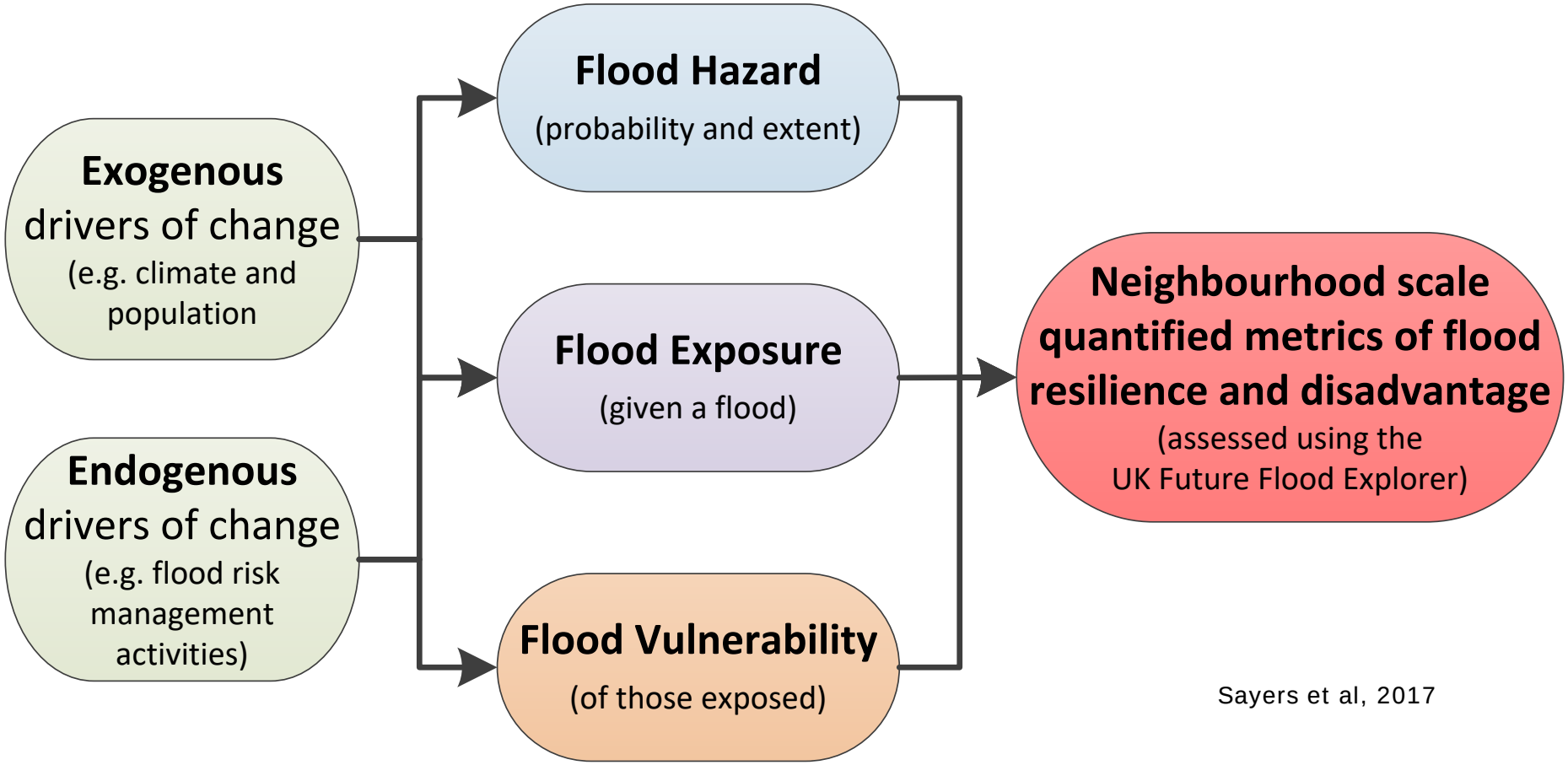
Introduction

- **Study provides a quantified UK scale assessment that buildings upon the:**
  - UK Climate Change Risk Assessment (Future flooding, Sayers et al, 2015)
  - JRF's climate programme (Climate Just, Lindley et al., 2011) and extensions to this work in Scotland (Kazmierczak et al., 2015)
  - Flood Hazard Research Centre (FHRC) on social flood vulnerability (Tapsell et al.,2004 and others)



Basic approach: Overview

Framework of UK analysis (using the UK Future Flood Explorer, FFE, Sayers et al, 2016)



Sayers et al, 2017

Basic approach: Futures

Exogenous drivers of future change in flood risk

Climate change

Changes in mean sea level, peak river flow and short duration intense rainfall based on projected changes in Global Mean Temperature (GMT) of 2°C and 4°C (from the 1961-90 baseline as used in UKCP09) by the 2080s.

→ Changes in the chance of flooding

Population growth

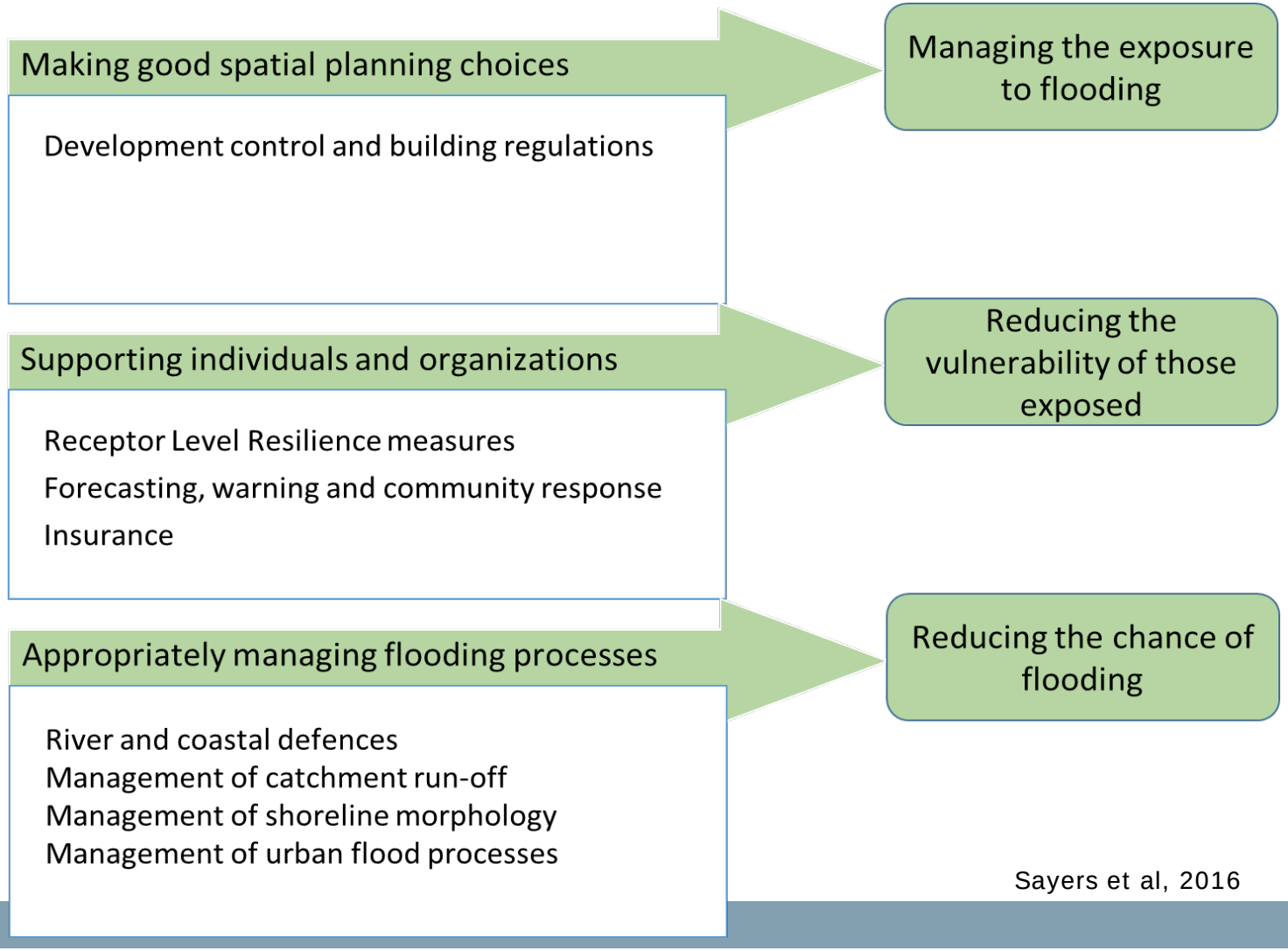
Changes in population by local authority based on low and high growth projections as published by the Adaptation Sub-Committee (ASC, 2015) and used in UK CCRA (Sayers *et al.*, 2015).

→ Increased exposure to flooding

Sayers et al, 2016

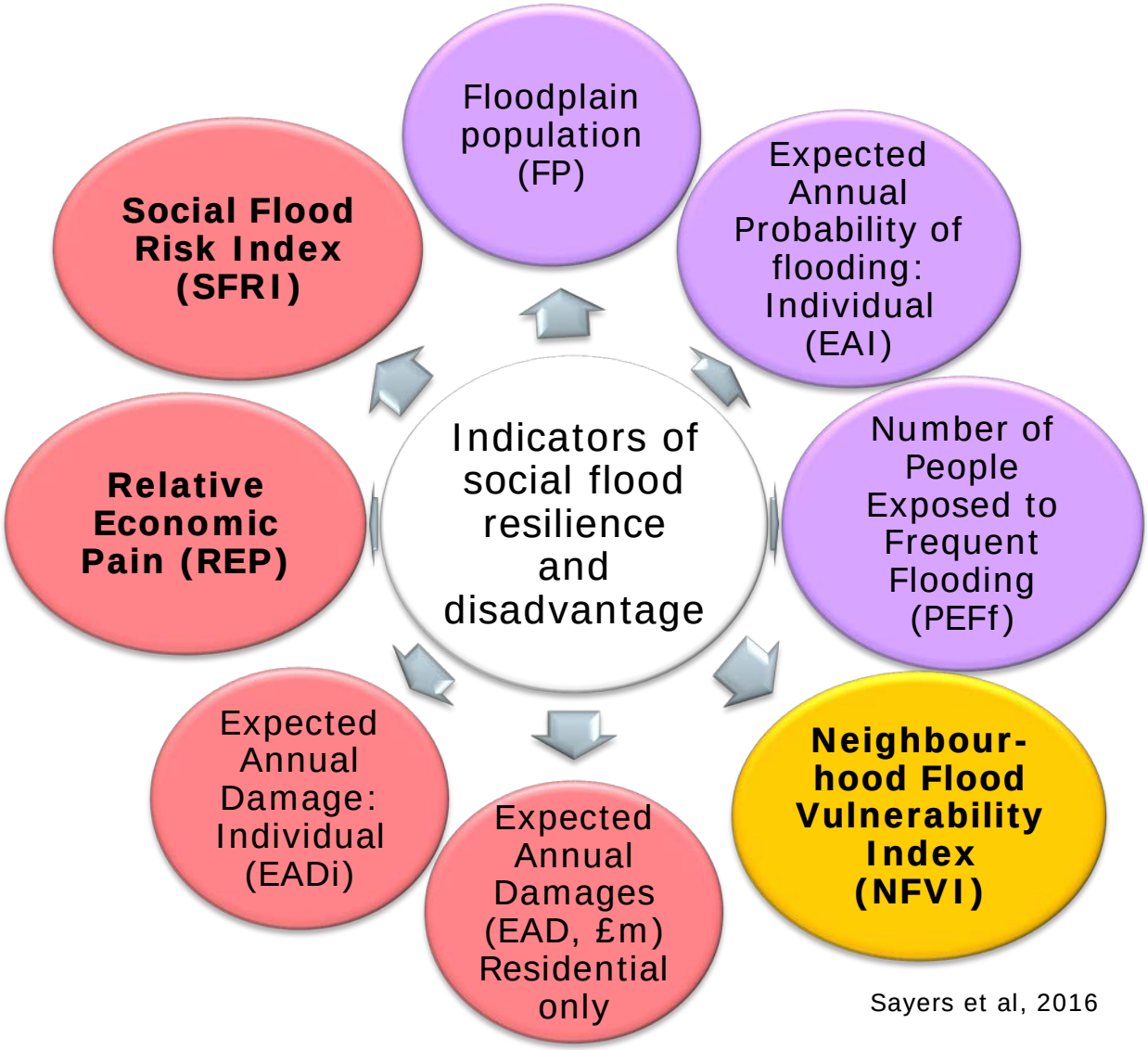
Basic approach: Futures

Endogenous responses to manage future flood risk



Sayers et al, 2016

Basic approach: Metrics



Exposure metrics

Vulnerability metrics

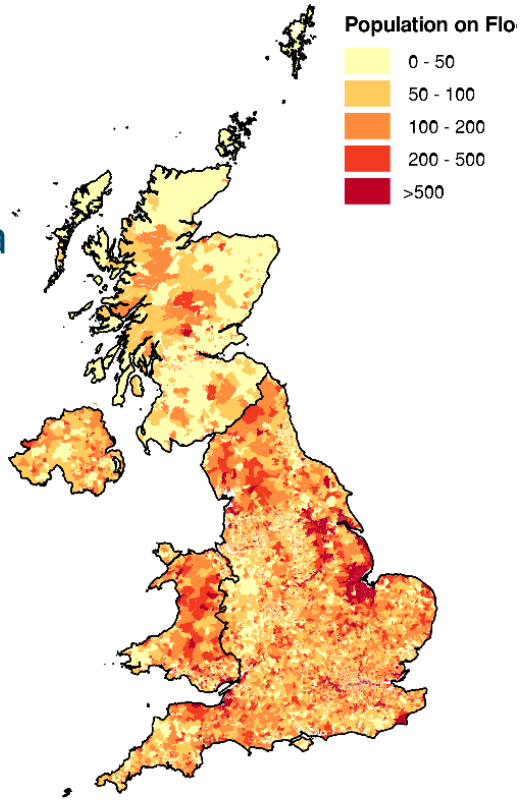
Risk metrics

Sayers et al, 2016

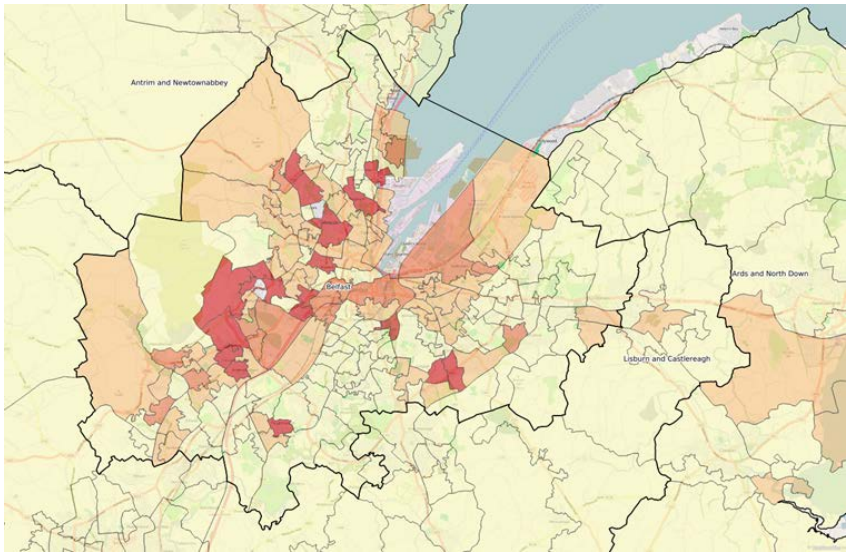
Basic approach: Scale

Social vulnerability

has been determined at a neighbourhood scale



All neighbourhoods



Above: Example neighbourhoods: Belfast

Below: Comparison of neighbourhoods across the UK

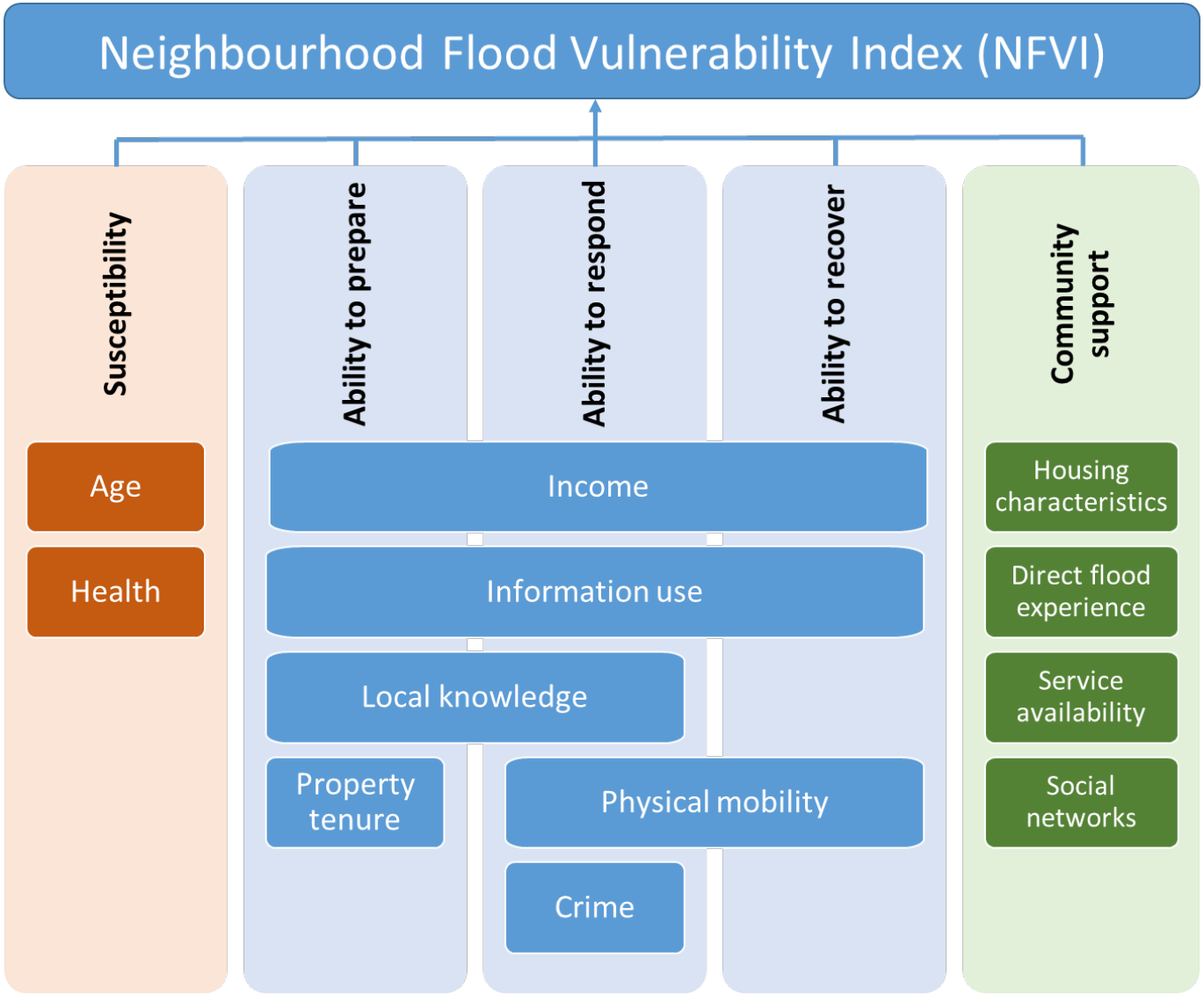
Area (ha)	10%ile	50%ile	90%ile	Average
England and Wales – LSOA	18	47	1,000	430
Scotland – DZ	9.7	23	1,900	1,200
Northern Ireland - SOA	32	150	5,700	1,600
Population	10%ile	50%ile	90%ile	Average
England and Wales – LSOA	1,300	1,600	2,000	1,600
Scotland – DZ	540	750	980	760
Northern Ireland - SOA	1,400	1,925	2,770	2,000

Basic approach: Social vulnerability

Social vulnerability is defined by the **Neighbourhood Flood Vulnerability Index** (NFVI)

At the spatial scale of ~1000ha and 1500 people

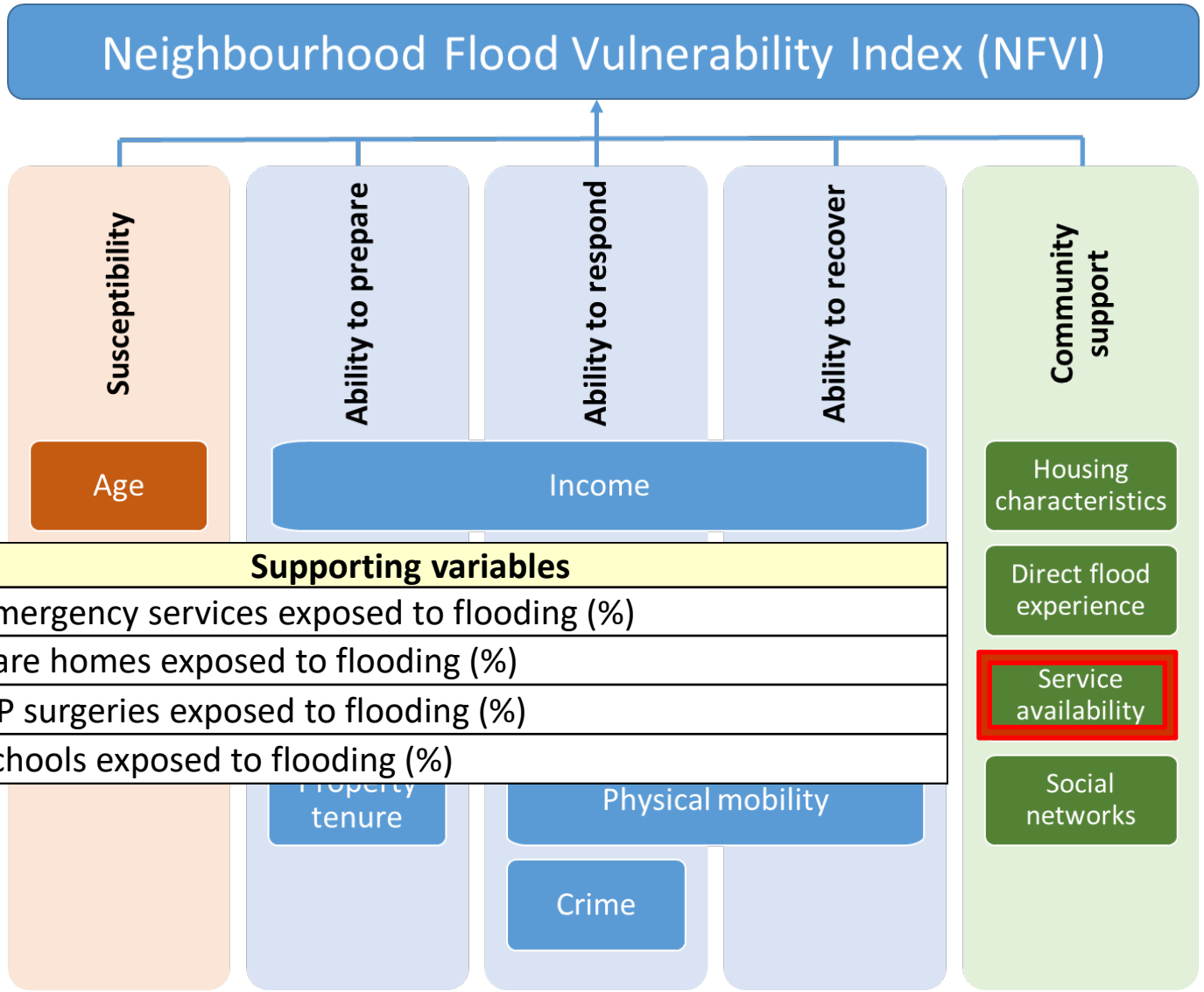
Sayers et al, 2016



Basic approach: Social vulnerability

Social vulnerability is defined by the **Neighbourhood Flood Vulnerability Index** (NFVI)

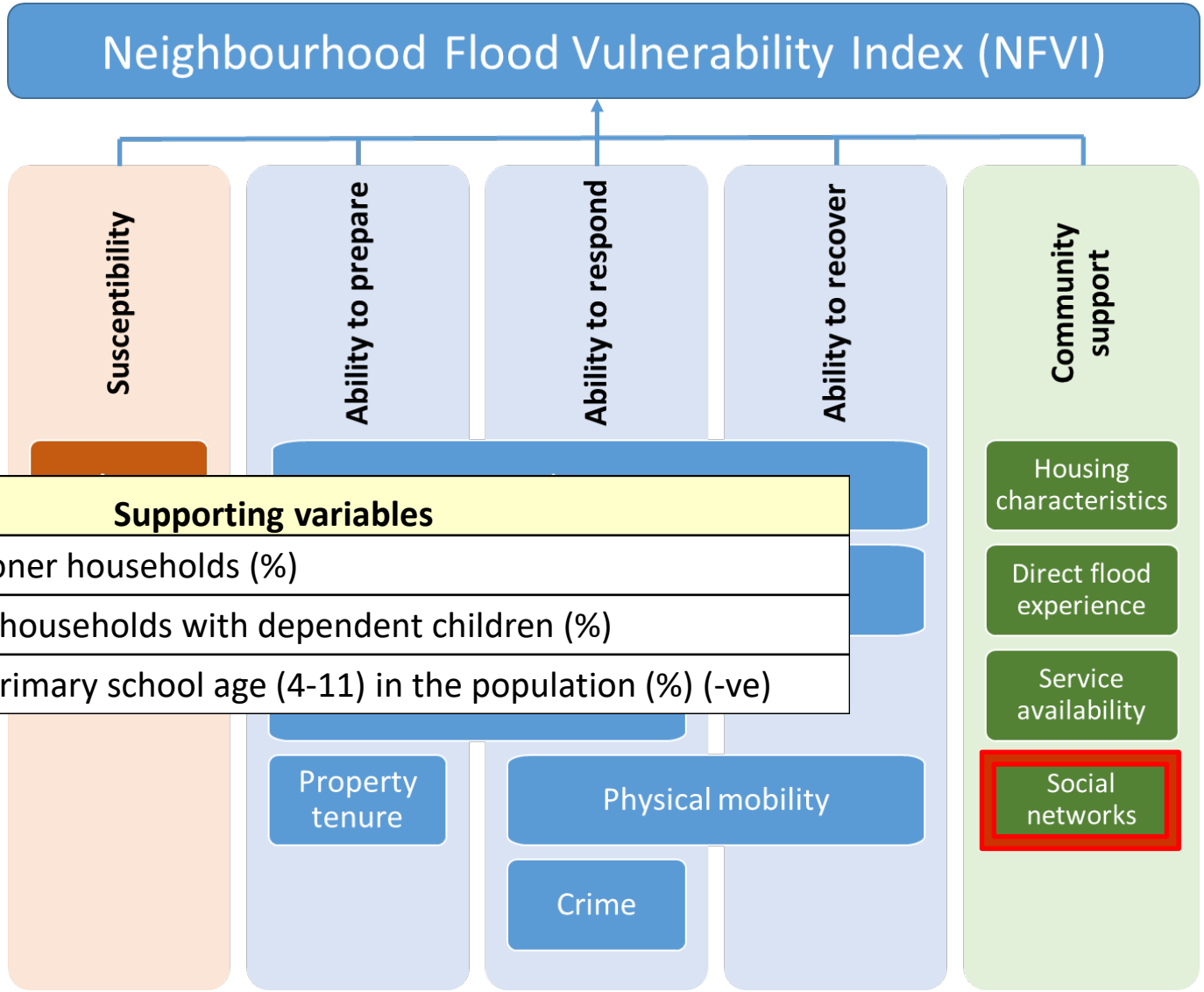
Sayers et al, 2016



Supporting variables	
s1	Emergency services exposed to flooding (%)
s2	Care homes exposed to flooding (%)
s3	GP surgeries exposed to flooding (%)
s4	Schools exposed to flooding (%)

Basic approach: Social vulnerability

Social vulnerability is defined by the **Neighbourhood Flood Vulnerability Index**



Supporting variables	
n1	Single-pensioner households (%)
n2	Lone-parent households with dependent children (%)
n3	Children of primary school age (4-11) in the population (%) (-ve)

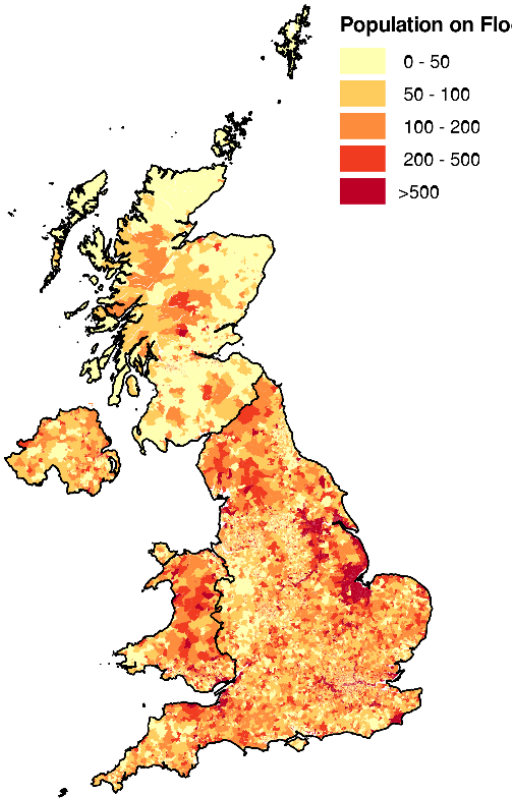
Basic approach: Vulnerability variables

The **NFVI** is based on twenty-three supporting variables.

Each is evaluated at a neighbourhood scale

Indicator	Supporting variables	
Age	a1	Young children (% people under 5 years)
	a2	Older people (% people over 75 years)
Health	h1	Disability / people in ill-health (% people whose day- to-day activities are limited)
	h2	Households with at least one person with long term limiting illness (%)
Income	i1	Unemployed (% unemployed)
	i2	Long-term unemployed (% who are long-term unemployed or who have never worked)
	i3	Low income occupations (% in routine or semi-routine occupations)
	i4	Households with dependent children and no adults in employment (%)
	i5	People income deprived (%)
Information use	f1	Recent arrivals to UK (% people with <1 year residency coming from outside UK)
	f2	Level of proficiency in English
Local knowledge	k1	New migrants from outside the local area (%)
Tenure	t1	Private renters (% Households)
	t2	Social renters (% households renting from social landlords)
Physical mobility	m1	High levels of disability (% disabled)
	m2	People living in medical and care establishments (%)
	m3	Lack of private transport (% households with no car or van)
Crime	c1	High levels of crime
Housing characteristics	hc1	Caravan or other mobile or temporary structures in all households (%)
Direct flood experience	e1	No. of properties exposed to significant flood risk (%)
Service availability	s1	Emergency services exposed to flooding (%)
	s2	Care homes exposed to flooding (%)
	s3	GP surgeries exposed to flooding (%)
	s4	Schools exposed to flooding (%)
Social networks (non-flood)	n1	Single-pensioner households (%)
	n2	Lone-parent households with dependent children (%)
	n3	Children of primary school age (4-11) in the population (%)

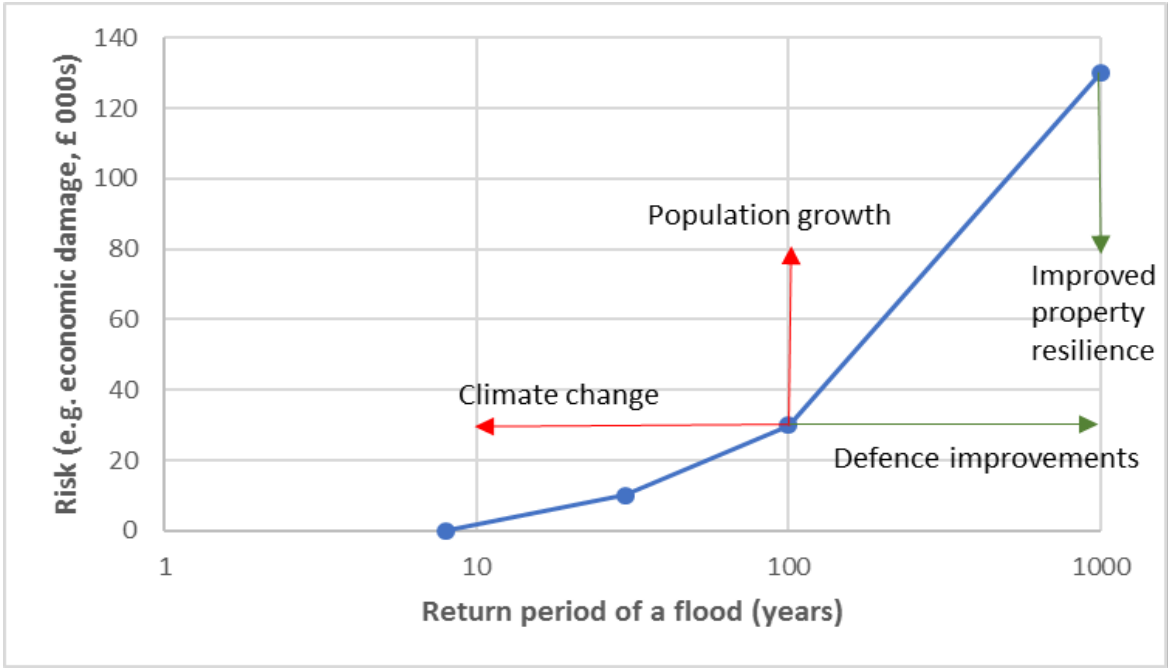
Basic approach: Analysis method



All neighbourhoods

Using the Future Flood Explorer (Sayers et al, 2016, CCRA):

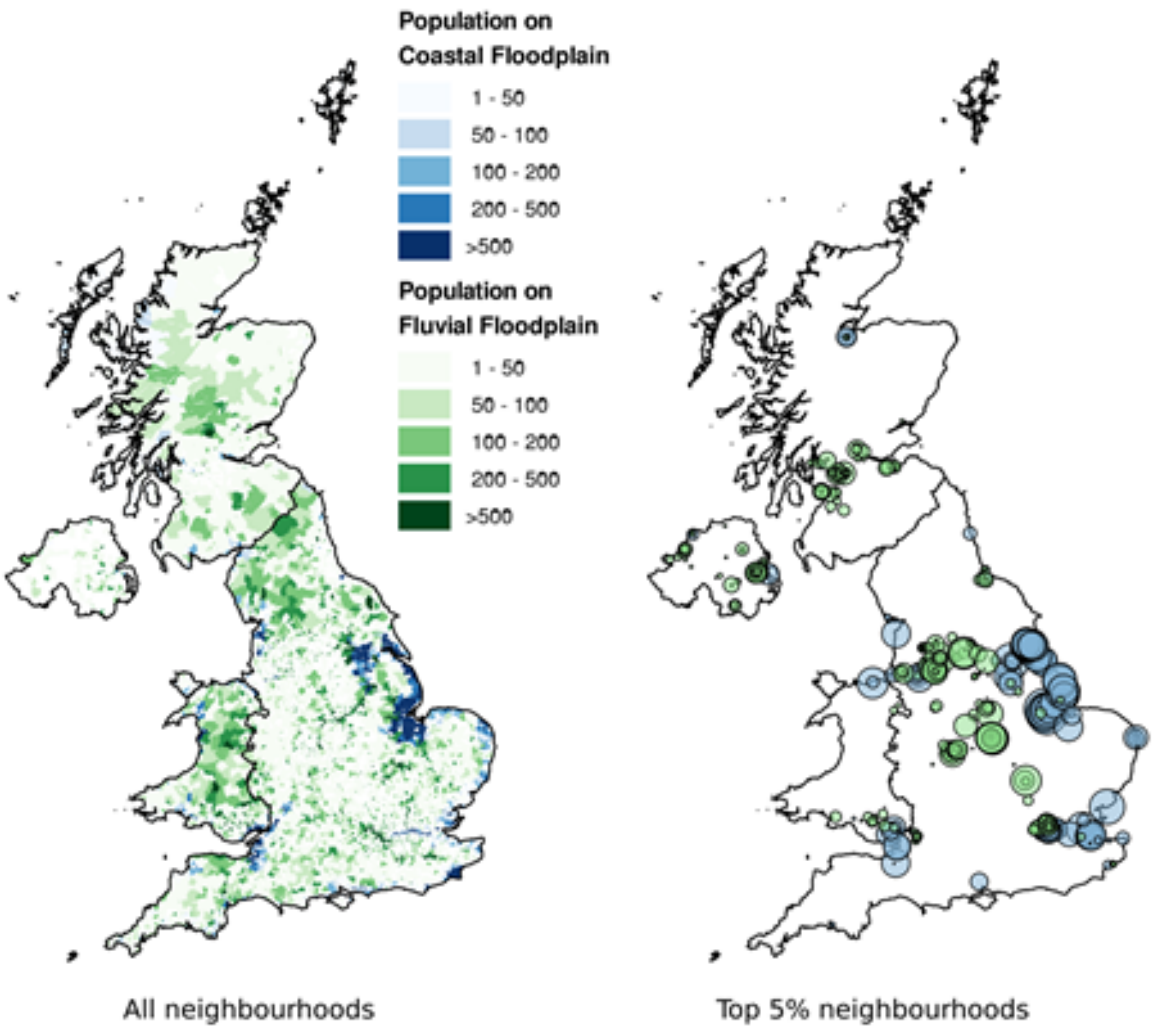
Neighbourhood Scale Impact Curves



Summary findings

Floodplain population, vulnerability and exposure to frequent flooding

- 6.4 million people live in flood prone areas; increasing to 10.8 million by 2080s
- 1.5 million people live in socially vulnerable neighbourhoods exposed to flooding (over 50% of these in ten local authorities).
- The social vulnerable are disproportionally exposed to flooding (e.g. 10% of people prone to coastal floods live in the 5% most vulnerable neighbourhoods)

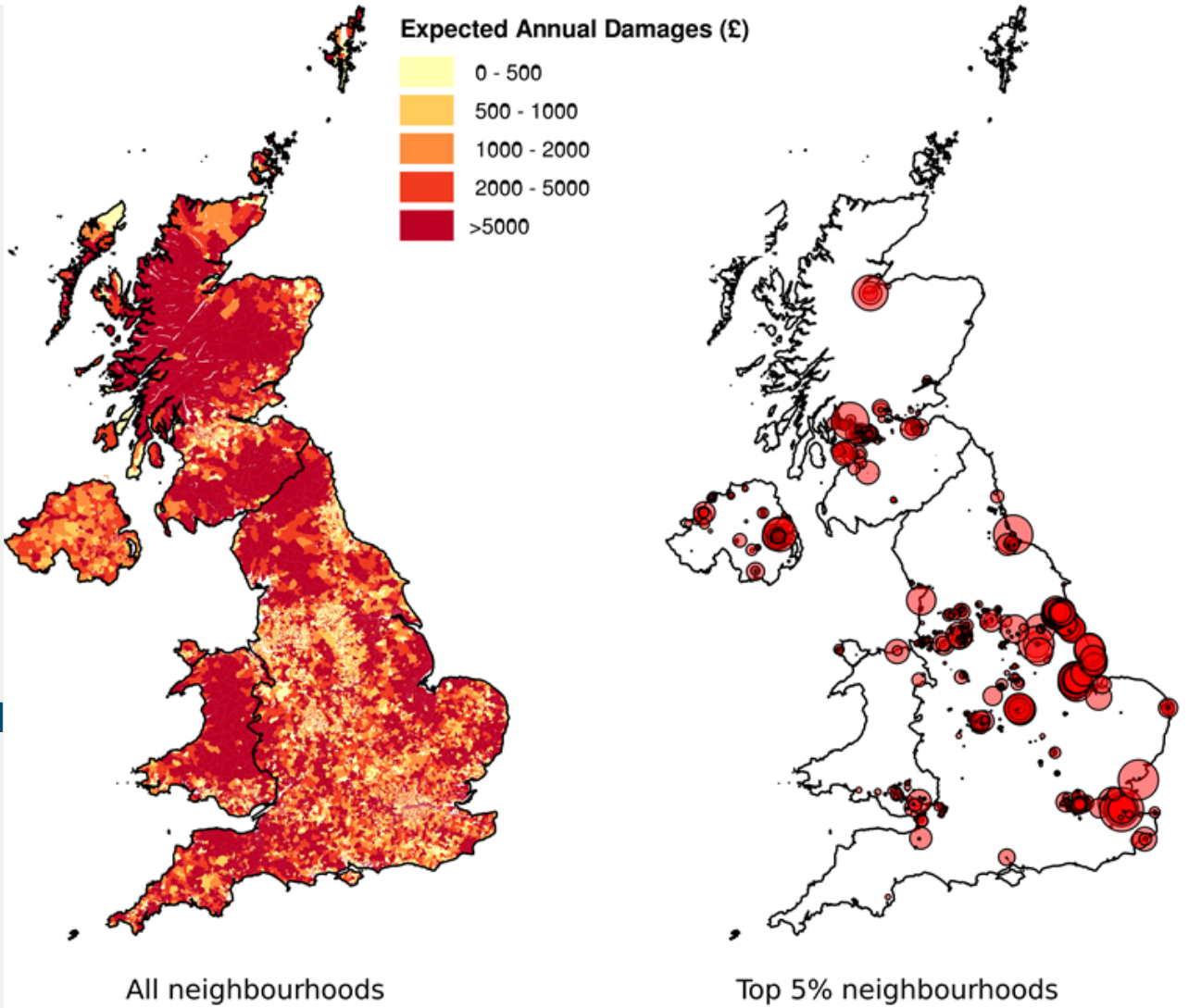


Spatial distribution of present day floodplain population – Sayers et al, 2016

Summary findings

Expected annual damages (EAD) and the influence of income and insurance

- £351 million EAD today rises to £1.1 billion, 2080s.
- EAD per person is often highest in the socially vulnerable neighbourhoods (particularly in coastal areas).
- Lower levels of income and insurance heighten the 'relative economic pain' of floods in vulnerable neighbourhoods.



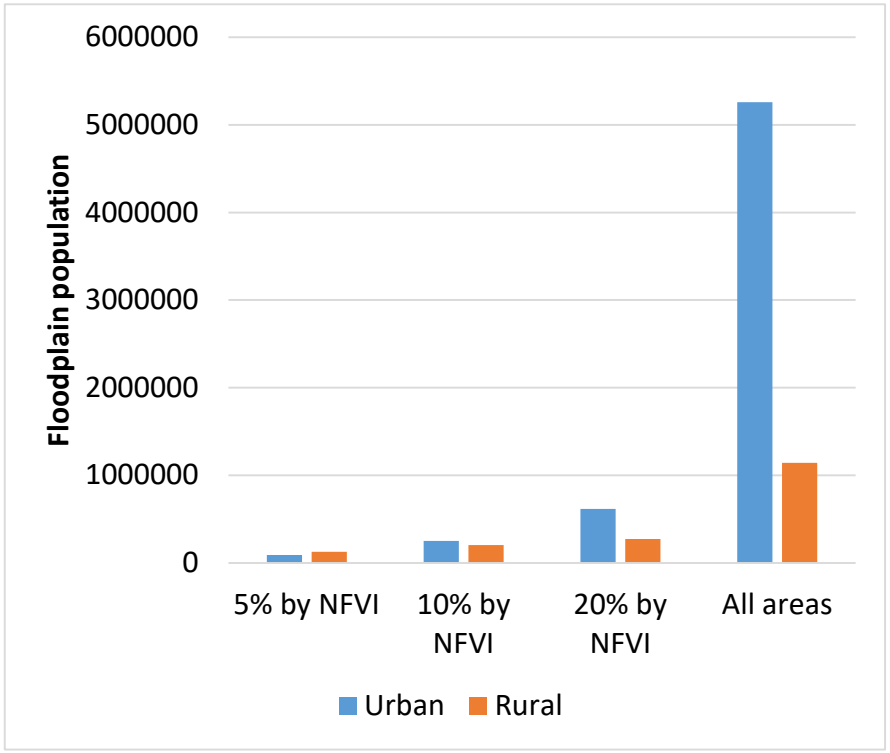
Map: Spatial distribution (Present day) – Sayers et al, 2016

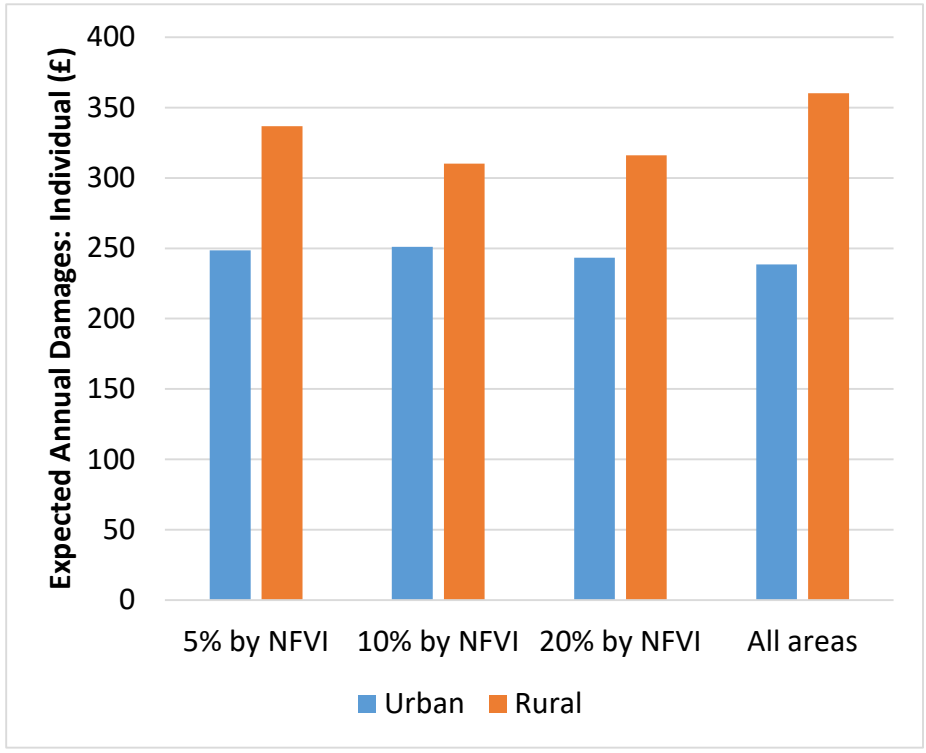
Summary findings

Urban and rural influences on flood disadvantage

- Urban areas have the largest number of socially vulnerable people in neighbourhoods prone to flooding, however vulnerable people living in rural settings are often exposed to more frequent flooding (and hence, on average, higher levels of EAD per person).

Present day: A comparison of flood risk in rural and urban settings (Sayers et al, 2016)

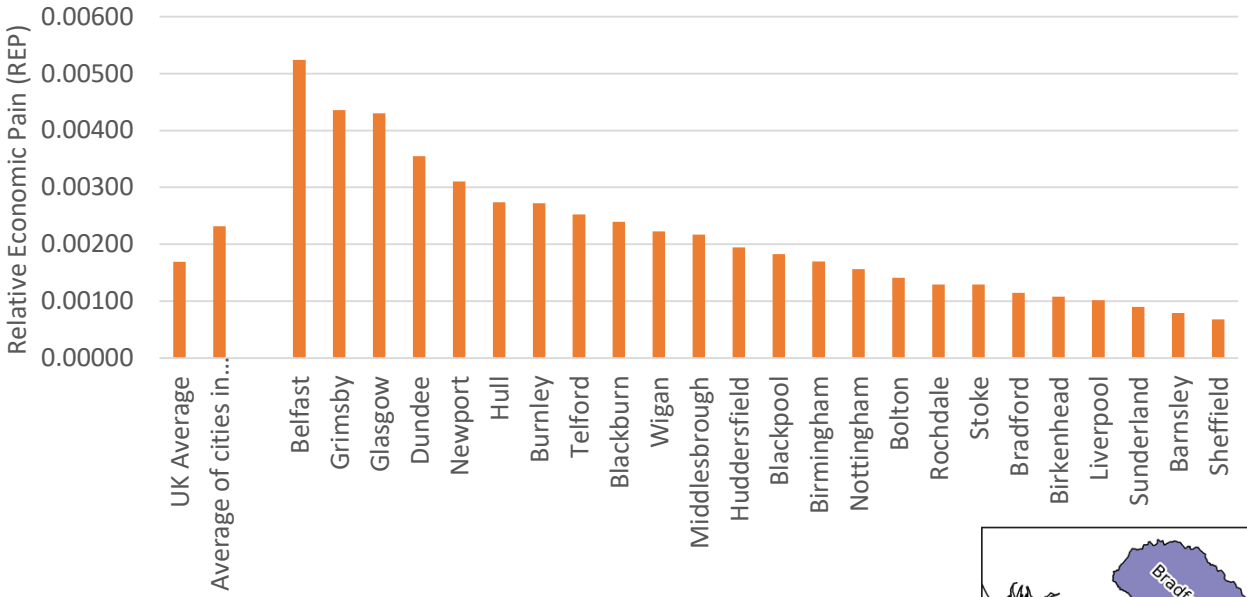


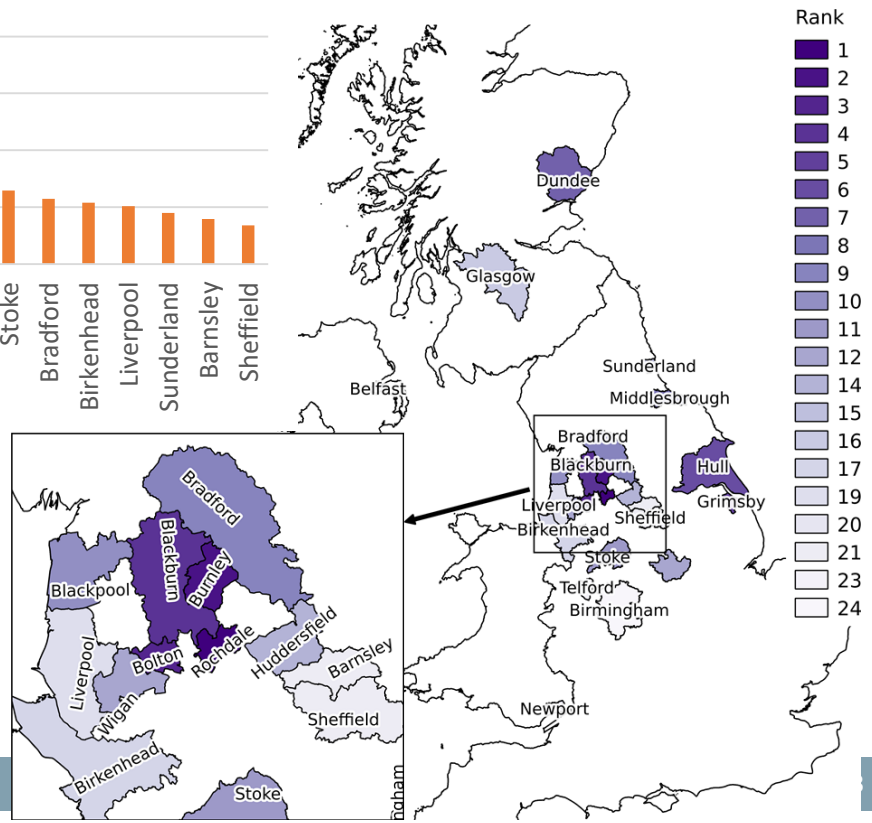


Summary findings

Cities in decline and the influence of flood disadvantage

- City regions in relative economic decline tend to experience levels of flood disadvantage above the UK average
- ..so flood risk could undermine economic growth in areas that need it most?





Above: **Cities in Decline: Relative Economic Pain of flooding (Sayers et al)**

Right: **Economic setting: Cities in decline (Pike et al., 2016)**

Summary findings

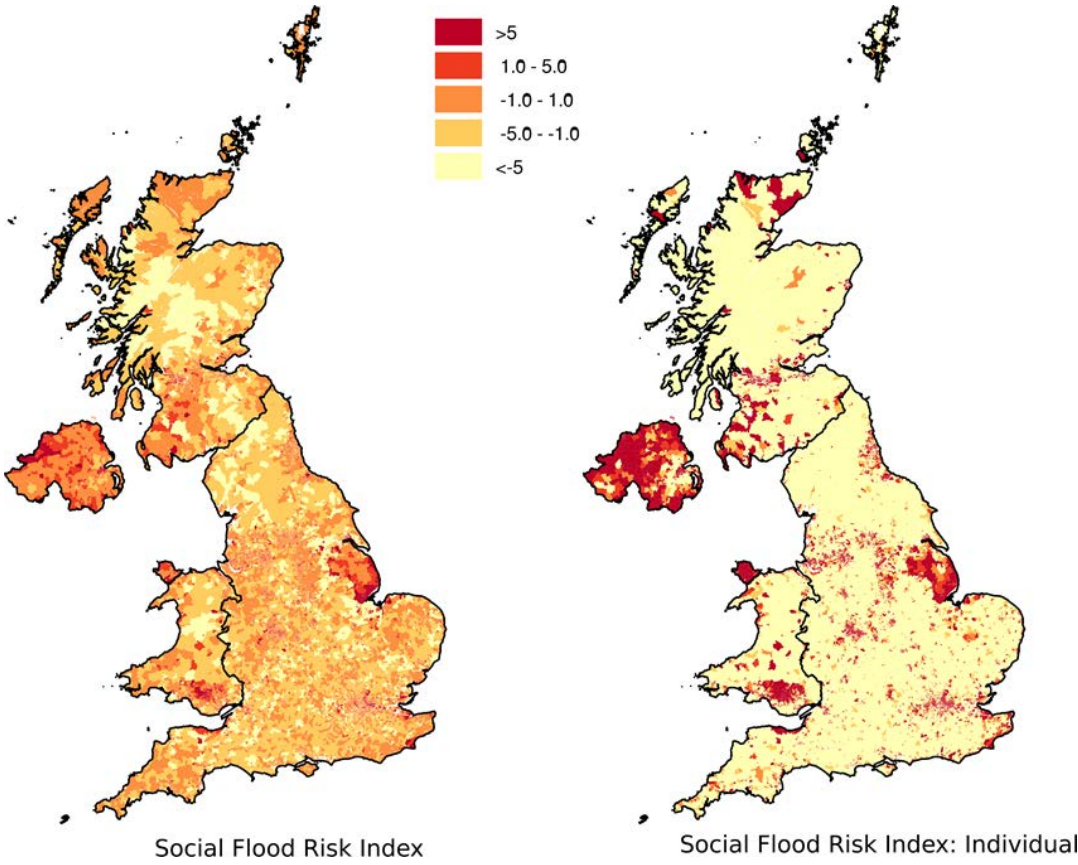
Local authorities and flood disadvantage

Group: social flood risk

- **(left)** Hull has the greatest levels of social flood risk (SFRI); it has the highest floodplain population, people exposed to frequent flooding and EAD.

Individual: social flood risk

- **(right)** Clusters in Northern Ireland, coastal areas from the Wash to the Humber, North and South Wales and the lowlands of Scotland



Map: Spatial distribution (Present day) – Sayers et al, 2016

Summary findings

Local authorities and flood disadvantage

Present day: Local authorities ranked by Social Flood Risk Index

1 in the top 5 ranked nationally
10 in the top 10 ranked nationally
25 in the top 25 ranked nationally
26 outside of the top 25 nationally

	Metric							
Local Authority (ranked top 25 by SFRI)	Social Flood Risk Index: Inidvidual (iSFRI)	Floodplain population	Expected Annual Probability of flooding: Individual (EAPi)*	Number of People Exposed to Frequent Flooding (PEFf) (per 1000 on the floodplain)	Expected Annual Damages (EAD, £m) - Residential only	Expected Annual Damages: Individual (EADi, £)*	Relative Economic Pain (REP)**	Neighbourhood Flood Vulnerability Index (NFVI)***
City of Kingston upon Hull (B)	31	1	1	1	1	1	38	20
Boston District (B)	6	12	109	9	7	73	71	1
Belfast	1	27	39	18	1	55	13	2
East Lindsey District	21	9	7	14	12	105	77	5
Glasgow City	14	15	29	4	6	48	25	50
Swale District (B)	7	49	51	32	9	54	14	10
Newham London Borough	46	3	188	17	2	124	65	15
City of Leicester (B)	19	20	116	12	16	25	32	13
Shepway District	9	65	38	28	14	15	36	16
North East Lincolnshire (B)	34	10	14	19	11	97	21	19
Birmingham District (B)	47	8	111	7	17	129	66	22

Summary findings

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Local authorities and flood disadvantage

Present day: Local authorities ranked by Social Flood Risk Index: Individual

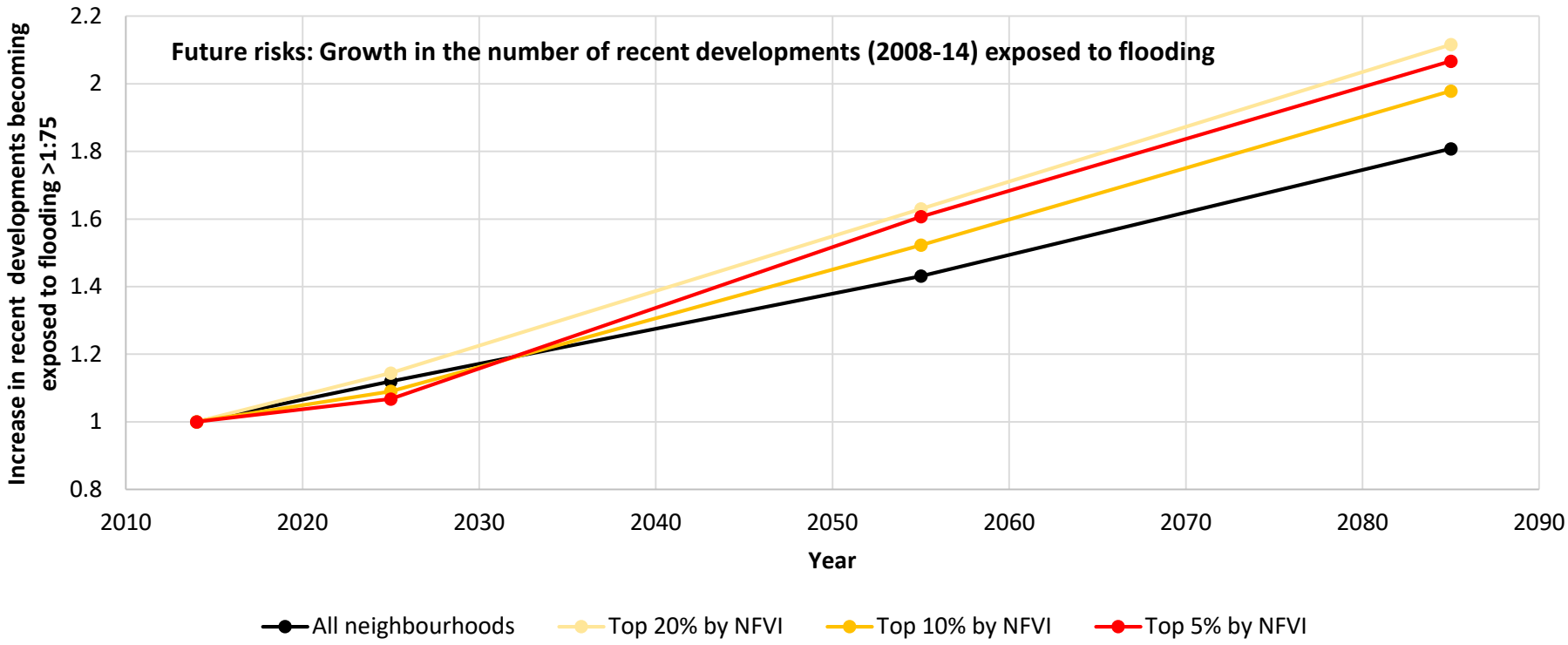
- 1 in the top 5 ranked nationally
- 10 in the top 10 ranked nationally
- 25 in the top 25 ranked nationally
- 26 outside of the top 25 nationally

	Metric							
Local Authority (ranked top 25 by Individual SFRI)	Social Flood Risk Index (SFRI)	Floodplain population	Expected Annual Probability of flooding: Individual (EAPi)*	Number of People Exposed to Frequent Flooding (PEFf) (per 1000 on the floodplain)	Expected Annual Damages (EAD, £m) - Residential only	Expected Annual Damages: Individual (EADi, £)*	Relative Economic Pain (REP)**	Neighbourhood Flood Vulnerability Index (NFVI)***
Belfast	3	27	39	78	15	55	13	2
West Dunbartonshire	12	184	4	9	40	6	4	18
Inverclyde	49	380	10	10	244	36	5	21
East Ayrshire	19	231	26	29	80	20	8	9
Derry City and Strabane	15	169	58	52	150	162	43	3
Boston District (B)	2	12	109	173	7	73	71	1
Swale District (B)	6	49	51	144	23	54	14	10
Hartlepool (B)	46	345	43	140	160	25	2	66
Shepway District	9	65	38	62	14	15	36	16
Sir Ynys Mon - Isle of Anglesey	80	384	32	108	239	21	29	11
Mid Ulster	60	341	42	46	271	126	28	33

Summary findings

Recent developments in socially vulnerable neighbourhoods (England)

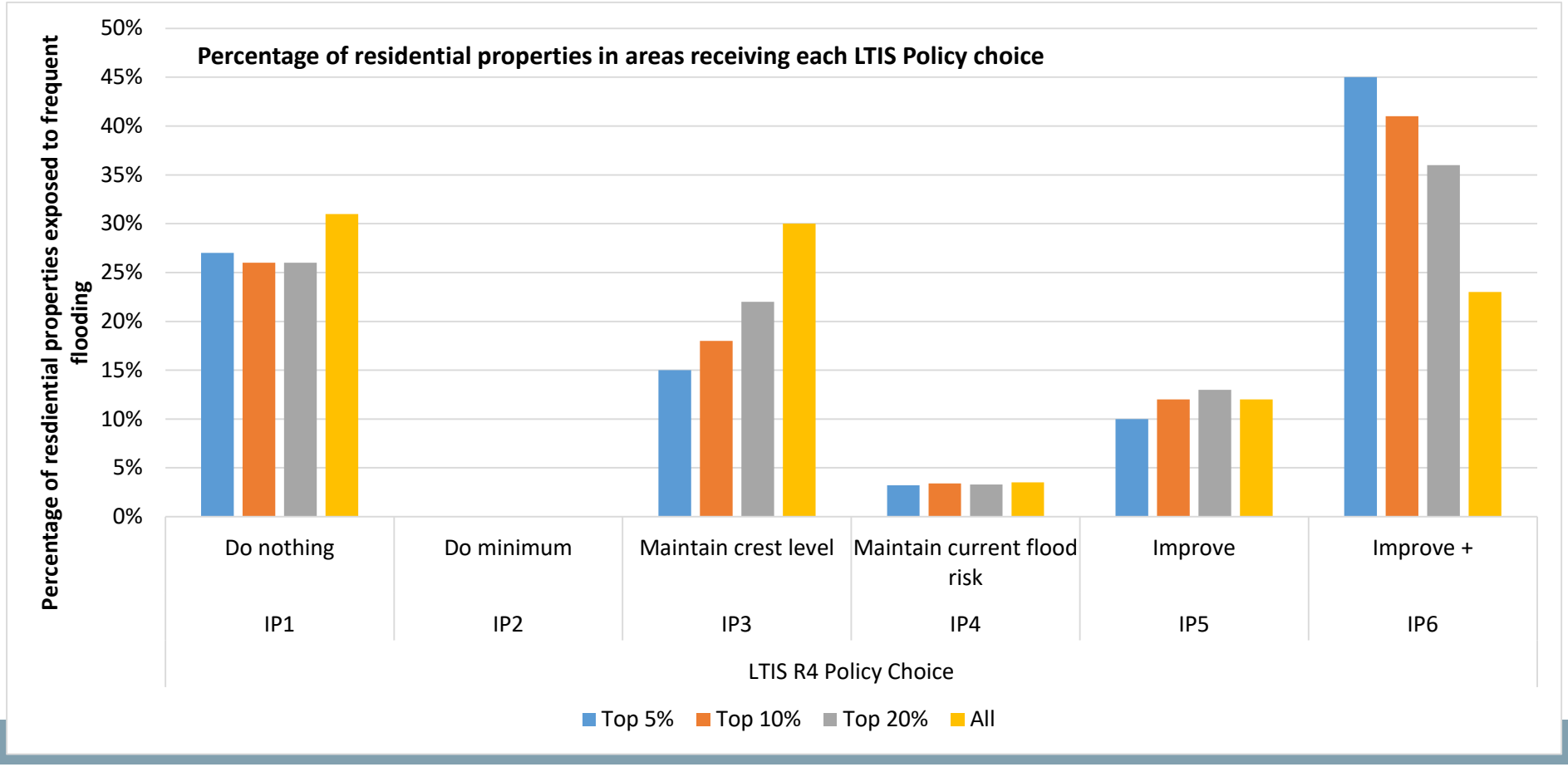
- Recent developments (2008-14) in areas prone to frequent coastal and surface water flooding (1-in-75 years or more frequent) have disproportionally taken place in the most vulnerable neighbourhoods.
- By the 2080s all developments built between 2008-14 will experience a significant increase in exposure to flooding. Across all sources of flooding the increase is greatest in those developments built in the most vulnerable neighbourhoods (but this is particularly the case in coastal floodplains).



Summary findings

Long-term investment in England: Evidence for greater investment in vulnerable neighbourhoods

- There is strong evidence to support improving the protection provided to the most vulnerable neighbourhoods.



Conclusions

The findings

- Today some 6.4 million people live in flood prone areas in the UK and this is set to increase to 10.8 million people by the 2080s
- Around 1.5 million people live in socially vulnerable neighbourhoods exposed to flooding, with over 50% of these in just ten local authorities.
- Cities in relative economic decline, coastal areas and dispersed rural communities experience levels of flood disadvantage above the UK average, suggesting flood risk could undermine economic growth in areas that need it most.

The recommendations

- Use new indicators (NFVI, SFRI and REP) to highlight the risks faced by the most socially vulnerable.
- Use these indicators to better target support for the most socially vulnerable in flood investment decisions.
- Ensure flood risk management policy actively supports inclusive growth.
- Better reflect the disproportionate long-term flood risks faced by vulnerable neighbourhoods in national and local planning policy.

Further information

- **The full report by Paul Sayers can be downloaded here**
  - Sayers, PB, Horritt, M, Penning-Rowsell, E and Feith J (2016). Present and future, flood vulnerabilty and disadvantage: A UK Assessment.
  - http://www.sayersandpartners.co.uk/flood-resilience-in-disadvantaged-areas.html
- **Journal paper:**
  - Sayers et al (2017). Flood vulnerability, risk and social disadvantage: Current and future patterns in the UK. Journal of Regional Environmental Change
- **Contacts**

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- **Website resources**

  www.sayersandpartners.co.uk

  And many output datasets available via www.climatejust.org.uk